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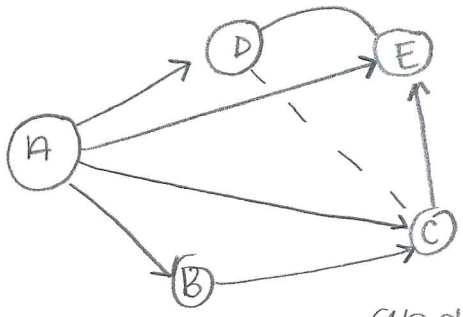
CSCI 3104 **Profs. Grochow & Layer**
Problem Set 7 **Spring 2019, CU-Boulder**

help on kahn academy

2. (10 pts) Ginny Weasley needs your help with her wizardly homework. She's trying to come up with an example of a directed graph $G = (V, E)$, a start vertex $s \in V$ and a set of tree edges $E_T \subseteq E$ such that for each vertex $v \in V$, the unique path in the graph (V, E_T) from s to v is a shortest path in G, yet the set of edges E_T cannot be produced by running a depth-first search on G, no matter how the vertices are ordered in each adjacency list. Include an explanation of why your example satisfies the requirements.



In my example, S = A.
Forward edges are
A,B B,C A,C A,E A,D
Back edge is E,D
Cross edge is C,D
and the tree edges are
A,B B,C A,E C,E

If we ran a DFS on my example, the vertices would be given as
A,B,C,E,D if S = A it would go from A → B → C → E → D

When the DFS should actually choose the direct shortest path from A → B, A → C, A → D, A → E.